ſo much miſchief to Chimneys, tops of Houſes, *&c.* not to mention the damages at Sea.

During the ſaid Storm, and about 8 a Clock in the Morning, I caſt my Eye upon my Barometer, and obſerv'd, that I had never ſeen the Quick-ſilver ſo low; but half an hour after the Quick-ſilver began to riſe, tho the Storm was not at all abated, at leaſt to any appearance; from whence I concluded, and ſaid it to thoſe that were about me, that the Storm would not laſt long; and ſo it happened.

There are ſome that affirm, that the ſcattering of this Salt water by the Storm will do a great deal of harm to the Fruits of the Earth; but for my part I am of a quite different opinion, for I believe that a little Salt ſpread over the ſurface of the Earth, eſpecially where it is heavy Clay-ground, does render it exceeding Fruitful; and ſo it would be if the Sand out of the Sea were made uſe of to the ſame purpoſe.

VI. *Part of a Letter from Mr* Anthony van Leuwenhoek, F. R. S. *concerning the Figures of Sand.*

Delft, Dec. 4. 1703. N. S.

I Take the liberty again of ſending you the following Obſervations.

I remember I have formerly affirmed of Sand, that you cannot find in any quantity whatſoever two Particles thereof, that are entirely like each other, and tho perhaps in their firſt Configuration they might be alike, yet at preſent they are exceeding different; the Sand eſpecially that we make uſe of is obnoxious to ſo great alterations, that it would be a wonder, if even in its ſmalleſt Par-

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Particles, of which there may be a thouſand in one ſmall grain, there ſhould be an exact ſimilitude.

For let us conclude (as I have often ſuppos'd) that our common Sand, of which one grain differs from another in pellucidity, was found at firſt with ſmooth ſides and ſharp points, the ſaid points and ſides are ſo rubb'd one againſt t'other, that ſeveral ſmall pits or holes may be perceiv'd in them, whereby they loſe their firſt figure, and who can conceive what changes thoſe Particles of Sand undergo, that lye next the ſuperficies of the Terreſtial Globe, and eſpecially ſuch as lye ſome depth under a ſtony ground where laden Waggons paſs often, for thoſe Particles of Sand, by frequent compreſſions and colliſions, wound each other, indenting holes in their ſides, and breaking off the ſharp Points or Angles; not to mention what alterations are made in theſe ſmall bodies by Storms, Thunder, Earthquakes, *&c.*

After having exerted my poor Obſervations on theſe matters, I got ſome ſhining Sand from an old Gentleman, a Kinſman of mine, who was Preſented with the ſame by a Book-keeper belonging to the *Eaſt India* Company, in the year 1648. and to the beſt of my remembrance Folks us'd to ſtrow their Letters with ſuch a kind of Sand about that time.

This Sand, tho very thin, was not tranſparent, the ſhiningneſs being wholly occaſioned by the reflexion of the Light from the poliſht ſides; ſeveral Particles of the ſaid Sand, which were much bigger than the reſt, did not reflect any Light, tho to the naked Eye they ſeem'd ſmooth; from whence I concluded, that they had loſt their glance by a frequent rubbing their ſides againſt others.

When I viewed ſeveral grains of the aboveſaid Sand with my Microſcope, I was ſurpriz'd to ſee that many of them were hexangular, and the more, when I had ſifted the fineſt from the courſeſt; neither could

I obſerve that any of the Sands were like each other.

I view'd the ſaid Sand with great attention ſeveral times, imagining that by ſome Earthquake or other it might be thrown up from the place where it had lain in reſt, to the ſuperficies of the Earth; and many grains, as I fancy'd, had preſerv'd their original ſhape and figure, for they had received little or no damage, eſpecially the ſmall ones, and many of thoſe had ſuch points and ſides, that no Diamond, tho poliſht by able Workmen, could equal the beauty of it.

I infus'd ſome of this Sand into *Aqua fortis*, to try whether it would diſſolve them, or deprive them of their ſhining quality, and tho it lay in the ſaid Water ſeveral days, I could not perceive any alteration in it.

Moreover, I tried the ſaid Sand with ſo brisk a Fire as was capable of melting Silver, and yet it did not affect either its Figure or Glance.

Theſe Particles of Sand being exceeding ſmall, and not unlike what we call white ſcowering Sand; I thought it worth the while to Deſign ſome of them.

Fig. 1. Tab. 1. A B C D E F repreſents an hexangular grain of Sand that was as bright and ſhining as any poliſht Metal, and the triangular Figures which appeared upon it were as bright as the reſt of the body, which occaſion'd a very agreeable ſpectacle, and could not be contemplated without aſtoniſhment.

I plac'd another grain of Sand before one of my Glaſſes, leſs than the former, but it was flat, and in my opinion, not the 16th part ſo big as a courſe grain choſen out of our common white Sand.

This was a ſurprizing Figure, and the firſt perſons that ſaw it were 3 Painters, who were filled with wonder in viewing it, and one of them, who was not the leaſt among them, offered his ſervice to draw the figure of ſuch a wonderful Sand, and another deſired him to let him to take a Copy of the ſame, that he might let other curious perſons ſee the ſtrange things in ſuch a ſmall body.

In the ſaid Sand, which is deſcrib'd by G H I K L, you may ſee not only, as it were, a ruined Temple, but in the corner of it G H I appear two Images of humane ſhape, kneeling, and extending their Arms to an Altar, that ſeems to ſtand at a little diſtance from them; this was ſtill the more agreeable, becauſe it was as bright as any poliſht Steel.

Fig. 3. M N O P repreſents (as near as the Limner could trace it) another hexangular ſmall Sand, with two ſharp points like Pyramids, and each ſide that compos'd the ſaid points were very ſmooth and ſhining: I have ſeen ſeveral ſuch Sands, that on each ſide had a ſmooth, ſhining and oblique ſuperficies, inſomuch, that upon one ſingle grain I have counted 24 ſuch poliſht ſides or faces.

I have alſo obſerved ſeveral ſmall Sands, that inſtead of terminating their ſix ſides in a ſharp point, ended ſometimes in a Triangle, Quadrangle, and even in a Pent or Hexangular ſhining flatneſs.

I remarkt ſeveral three ſided Sands, of which ſome were regular Triangles, which were very ſhining and very thin, others were thicker. See Fig. 4. Q. R. S.

I ſhewed the Painter other Sands that were compleat hexangles, the flat ſides of which appeared to us like a Steel Looking Glaſs in a Frame, and in ſome of them were little holes, which ſeemed to ſome to be likewiſe hexangular; whence I concluded, that ſuch a hole was made from the preſſure of another Sand of the like Figure. See Fig. 5. T. V. W.

When I lookt upon any of theſe Sands ſideways, each of the ſix ſides, which in the Figure appear as a Frame or Border, ſeem'd to be a Poliſht Looking-Glaſs.

Fig. 6. X Y Z does alſo repreſent an Hexangular Sand oppoſed to the ſight a little ſidewiſe, whereby the Reflection is not ſo full and large as if the flat ſide were placed

placed directly before the eye; but then it came from the two ſides which repreſent a part of the Frame, and are ſhown in this figure by the Letter X.

Now when the hinder part of ſuch a Sand is brought before the ſight, I obſerve that it has the ſame figure, and that then, that part of it, which I ſhould have deſcribed as a dark circle of the ſhining Sand, was compos'd of twelve bright, oval, flat ſuperficies.

I gave the Limner another hexangular Sand to draw, whoſe bright Superficies or Area was of a different make from its circumference, for there appear'd in the middle of them ſeveral triangular figures, which, tho they were ſomething rais'd or imboſt, were very bright, which was very pleaſant to behold; ſee Fig. 7. A B C, and altho the circumference in this poſition appear'd very dark, yet the ſides thereof, when oppos'd to view, were no leſs bright and ſhining.

I caus'd the Painter to deſign another grain of Sand, which is repreſented by Fig. 8. D E F G H with its protuberant parts and their reſpective ſides; but it is impoſſible to deſcribe with the Pen the beauty and variety of the figures in the ſaid Sand, neither can any body imagin it but thoſe that ſee it.

I turned the oppoſite ſide of the ſaid Sand to my Glaſs, whereby I diſcover'd the ſeveral ſhining Angles thereof, as in Fig. 9. I K L M.

I placed another ſmall ſhining Sand before my Glaſs, which appear'd as in Fig. 10. O P Q R, ſeveral of whoſe ſides were unblemiſht; in a word, if I ſhould undertake to give you a view of a thouſand others, and ſhould enter upon a ſtrict examination of every one of them, I doubt not but we ſhould diſcover every one of them to be of a different ſize and figure, beſides ſeveral other particularities which might be peculiar to each one, as the great Rent or Breach, which in fig. 8. is deſcrib'd by a a.

I have alſo obſerv'd that this ſhining Sand weighed twice as heavy as our common ſcowring Sand.

Now when I took ſome of the Pellucid or Tranſparent Sand (which did not ſhine, becauſe it reflected no light) I obſerved that the ſides and angles of each Grain were freer from ſcars and blemiſhes than moſt others I had yet conſider'd, from whence I concluded, that ſuch Sand had not lain long near the ſuperficies of the Earth.

I placed one of theſe Sands before a Microſcope, ſo as the Painter might have a full view of three of the four oblique ſides, ſee Fig. 11. A B C D E F, one of the flat ſides being repreſented by B C D G, another D E A G, which had a ſtreak or ſcratch in it, ſuppos'd to be done by the preſſure of another Sand upon it; and the third flat ſide is deſcribed by B G a b.

Having repreſented this tranſparent Sand in its ſhorteſt poſition, I put it in another ſight, ſo as you might ſee it in its full length, as in Fig. 12. H I K L M, and therein ſtreaks or little holes, which I firmly concluded to be occaſioned by the colliſion of other Sands.

I likewiſe took notice of ſome, but very few, Sands that were long and ſlender, and which did not appear bigger thro a common Microſcope, than a ſingle hair of ones Beard to the naked Eye.

I have taken ſeveral of the ſhining Sands and broke 'em to pieces, and then viewed the broken pieces thro a Microſcope, and obſerved, that many of thoſe ſmall Particles, tho they were a thouſand times leſs than a grain of common Sand, had a glance or luſtre when the light fell upon them, and that ſeveral ſuch particles, and ſome that were larger, if you lookt upon them againſt the light, repreſented a fine blooming red; but ſome of them were ſo but in part, from whence I concluded, that part which was not red was thicker than the reſt, and did not admit of light thro it. Among theſe ſmall broken pieces of Sand, I obſerved ſome that had ſix ſides, others that were iangular; all theſe Sands are to be conſidered as common Sand.

I took one of the above-mentioned long ſlender Sands, which I judged alſo to be one of the thickeſt, and placed it before a Microſcope, as you may ſee in Fig. 13. N O P Q, in which you may diſtinctly perceive four flat ſides.

I have obſerved in many Sands, that their bodies conſiſted of unſpeakably thin ſcales or ſcaly particles.

Among theſe ſhining Sands I diſcovered others that had no luſtre at all, neither had any of their particles after I broke them to pieces, but it appeared to be a dark red matter, and in other Sands ſo broken there was not only a red matter, but even an hundred ſhining particles, all proceeding from one Sand.

I have alſo ſeen ſome Sands, that in the middle of their ſhining ſides repreſented ſmall figures that gave no luſtre, but as I viewed them more narrowly, I found it was a red matter, incorporated as it were in the Sand.

I have placed ſeveral Sands of the courſeſt ſort before a Microſcope for the pleaſure I took in the viewing them, for one ſeemed to repreſent an agreeable Rock of Stone, another, a deep Cavern, inſomuch, that ſeveral perſons whom I made partakers of the ſight, were aſtoniſht to ſee ſuch various figures in ſuch ſmall bodies.

Theſe laſt Sands were not, I ſuppoſe, ſo ſhaped from the beginning, but thoſe cavities and protuberances which we eſpyed in them, came from various chances and accidents, as by the colliſion of other particles of Sand which were bigger than theſe, which in their turn were again broken by other bodies of a larger ſize, ſuch as Pebble ſtones, *&c.*

I have cleaved ſome grains of Sand, and diſcovered figures of Triangles in them.

I have by me ſome draughts of Stone compos'd of particles of Sand, but becauſe I will not heap up too many things together, I ſhall break off here.

Delf *in* Holland, February 1. 1704.

SOon atfer that the Cathedral Church at *Utrecht* was almoſt ruined by the dreadful Storm, my curioſity led me to view the fallen Pillars and other parts of that Building that lay about, and I obſerved, that ſeveral of the Pedeſtals were compos'd of red Stone, as alſo ſome Tombſtones; and that in another Church there was a whole Pillar of ſuch Stone, and foraſmuch as neither in our Town, nor any other Town that I know of, this ſort of Stone is made uſe of by Maſons in the building of Houſes, I took ſome of it home with me, in order to obſerve it with my Microſcope, and I did then imagin that that ſort of Stone conſiſted for the moſt part of large and tranſparent corns of Sand, and that the redneſs of the Stone was only caus'd by a certain red matter, which had produced ſuch a continuity or adheſion in the maſs of the Sand, as to be able to conſolidate it into a red Stone.

Being of this opinion, as I ſaid before, I took the little piece of red Stone, and ſeparated ſeveral Sand-particles from it as gently as I could; and becauſe the red matter which clung to ſome of the Sands more than others, hinder'd me from taking a diſtinct and clear view of each particular corn, I put ſome of them into *Aqua Fortis*, to try whether that would diſſolve the red matter, and reſtore its luſtre to the Sand; but in vain, for that Menſtruum was not able to ſeparate 'em. Then I took ſeveral of thoſe Particles of Sand that were ſurrounded with the leaſt of ſuch Red Matter, and placing them before the Microſcope, obſerved that ſome of 'em had ten or more ſharp Points or Protuberances, ſo neatly and regularly faſhioned, that no Poliſhed Diamond could out do them. I ſet one of the largeſt Corns of Sand before my Glaſs, and could perceive in the ſame, and that too in a very ſmall compaſs, ſeven neat Prominent Points (exceeding one another in length and bigneſs) iſſuing out of very ſmooth ſides; and I judged that one ſuch Sand was furniſht with above a hundred flat ſides, which were very ſmooth, and conſequently very ſhining, tho with the naked eye one could diſcover no brightneſs worth mentioning; the reaſon of which I conceive to be, that this Sand being partly tranſparent, admitted the light thro its Pores, and did not reflect it back like ſhining Sands.

Theſe Sands, tho I viewed never ſo many of them, I found to be each of a different figure, and when I pickt out any of them that were ſomewhat oblong, I ſeldom failed to diſcover at the ends a four or five ſided obtuſe point, ſo neat and regular as if it had been poliſht.

I broke to pieces ſeveral grains of Sand upon a clean Glaſs, and found that they were not near ſo ſtrong as the ſhining Sand, and having placed the ſmall particles of ſuch a broken Sand before my Microſcope, ſome of them appeared like whole Sand with its entire ſides and angles.

This was a very agreeable ſpectacle to me, to ſee ſo many neat ſmooth ſides, and ſo many exact points and angles all derived from a ſingle grain.

Tho it is impoſſible for any Limner to deſcribe theſe points and ſides exactly, yet I caus'd ſome to be deſign'd as well as I could.

Fig 1. Tab. 2. A B C D E repreſents thro a Microſcope one of the above-mentioned Sands, of which many together compoſe the Red Stone; A B C D ſhows the points, which are much more plainly ſeen than ſeveral others that cannot be diſtinguiſht, becauſe of their different poſitions.

Fig. 2 ſhews you another Sand which likewiſe has ſeveral points, tho not ſo obvious as the former, becauſe they do not ſtand ſo far outwards.

Fig. 3. M N O P repreſents the laſt mentioned Sand, only with this difference, that you ſee it in another poſition.

Fig. 4. Q R S T ſhews alſo a Sand of the aforeſaid Stone, in which, you may obſerve the Diamond cut better than the former.

Fig. 5. V W X Y Z repreſents two grains of Sand that were ſtill joyned to each other, the one is deſcribed by V W X, wherein you may obſerve ſeveral points, and particularly between W and X, and the other is ſhown by X Y Z, and the moſt of its points lye between Y and Z.

Now as ſome of the ſmooth ſides of theſe Sands were large, and others ſmall, and that all of them were not ſo ſmooth as poliſht Glaſs, and had ſeveral ſmall ſcratches or ſlits in them, I do ſuppoſe that might happen by the breaking or diviſion of theſe ſandy particles from one another.

That piece of the Red Stone that ſtill remain'd entire was about the bigneſs of a Pea, and when I beat it in pieces, there flew a ſpark of Fire out of it.

I made a ſmall bit of it ſo hot, that it was glowing, and ſo let it drop into water, ſuppoſing, that not only the particles of Sand would be ſeparated thereby, but that the red matter alſo which conſolidated the Sand would be divided from it too; but I found that the Sands only were ſeparated from one another, and each particle of Sand was as ſtrong as if it had never been in the Fire, and was alſo ſurrounded with the red matter; but in ſome of them, which had aſſumed a greater tranſparency than before, I could plainly diſcover that each Particular grain did conſiſt, or rather was a congeries of ſeveral ſmall particles, of which ou ſhould ſee in ſome Sands, fifty ſuch ſtanding out, like pointed pyramids, all tranſparent, and

ſome

ſome of them had the ſame figure as the grain of Sand it ſelf had.

By theſe Obſervations I was fully ſatisfy'd, that the Sands of which the above-mentioned red Stone was compos'd, had for the moſt part preſerv'd their original Figure, and that they were ſo hard and ſolid, that their falling one upon another could not produce any adheſion, otherwiſe than by the intervention of that red matter, which was interſpers'd and mixt with them.

From theſe remarks, I naturally turned my thoughts to Diamonds, and my hypotheſis is, that all the Diamonds that have or ſhall be diſcover'd, do not grow, nor are made in any ſeries of time, but were form'd like other Sands, in the beginning of the World, for how is it poſſible that ſuch a pelluid body can be produced in the Bowels of filthy Earth, by a congealing or coagulated ſuccus or moiſture; and if it were ſo, why don't we meet with very large Diamonds? for when a ſmall Diamond is once form'd, there would be a more than ordinary conflux of the ſame plaſtick matter thereto, as we find in other things, that they have always a ſtrong tendency or inclination to ſubſtances of a homogeneous nature with themſelves.

I have been aſſured that in ſome places, Water does filtrate thro the Rocks into the ſubterraneous Caverus, and coagulate at the top of thoſe Vaults or Particles like Nine-pins, and at laſt are really petrify'd.

We may allow this to be true, but if theſe Nine pin kind of particles, which I look upon to be nothing elſe but a petrify'd Salt, were obſerved with a Microſcope, and compared with the ſame Particles of the Rock, from whence the above mentioned Filtration proceeds, I make no manner of doubt, but that the Nine-pin like Particles would be found to differ from the other.

That I might be ſatisfy'd in my above mentioned Obſervations, I took a piece of white Marble that was brought hither

hither from *Italy*; it was of two ſorts, the one was ſtrong, and the other light and very brittle.

I broke the brittle Marble as gently as I could, that the configuration of the ſmall particles might not be much altered, and having viewed ſeveral of them with my Glaſs, I ſaw abundance of wonderful particles, which may juſtly be ſtil'd Sands with their regular ſides and angles, and many of them of the ſame figure as the ſhining Sand.

But not being ſatisfied with this hypotheſis, *viz.* that the above-mentioned particles were originally nothing elſe but Sand particles, with their angles and ſmooth ſides, and that at the time of their coalition or falling upon one another, they were all ſoft and flexible, and thereby were ſo rivetted and joyned together, as to become one ſolid body, which we call Marble, and conſequently the ſaid particles did for the moſt part change their figure, and aſſumed another form, proportionable to the ſolidity of their coalition, and that yet ſome of them had preſerved thoſe ſmooth ſides and angles, which they had at the time of their conjunction, the which angles and ſides repreſent the points that are found in Diamonds; and that in one particle of Sand you may diſcover three, and in another ſeven neat and regular points.

From theſe Obſervations, I imagined that almoſt all the Sand of the whole Earth have preſerved the figure that was given to it at the Creation, and that the particles thereof before they happened to collide or fall upon others, were compos'd of ſuch hard bodies, that they could not be joyn'd to others, and ſo have remained what they were originally; ſaving that by their frequent colliſions with other bodies their firſt figure may be ſomething impaired, and the nearer they lye to the ſurface of the Earth, the more ſubject they are to ſuch alterations.

When I oppos'd ſuch a Diamond-like Sand with its point to the ſight, I could ſee the ſaid point, but the ſides from whence the points ariſe, are the more obvious; and ſuch poſition the Sand would appear four, five or ſix ſided, and not only ſo, but where two ſides joyned, I could alſo perceive ſuch a point of a Diamond-cut ſtanding out.

I have thought fit to cauſe three of the Sand particles of the above-mentioned white Marble, as they were ſeparated from each other to be deſign'd.

Fig. 6. A B C D E F repreſents one of thoſe grains of Sand, of which a great number compoſe the white *Italian* Marble ſtone, wherein at each of theſe Capital Letters you may ſee its points or angles.

Fig. 7. G H I K L M ſhews you the ſecond Sand, and thoſe Letters the ſeveral points.

Fig. 8. N O P Q is the third Sand, wherein there is ſuch a flatneſs N O P, as is obſervable in few Sands.

I took a little piece of the ſaid Marble, the parts of which were very cloſe and compact, and making it red hot I dropt it in the Water, in the doing whereof, I obſerved not only the Sand particles were ſeparated from one another, but ſome of them broke away with that violence, that they were thrown out of the Water.

I took ſome of this Water preſently, in order to ſee what Salts were paſt over from the Stone into the Water; and I could ſoon perceive a ſort of a Membrane, or rather Scum over the Water, without being able to diſcover any Particles in the ſaid Scum, the which I conceived to conſiſt of coagulated Salts; and that there were ſome ſuch under the Scum; but they were ſo obſcure that I could not much count upon them; and the more, becauſe they were hid by the ſaid Scum.

I took then a larger piece of the above-mentioned Stone, and heating it red hot, I let it fall into the Water alſo, whereupon there came a thicker Scum over the Water, which I let lie upon it 24 hours, and then breaking it, and taking a little out of the Water, I found it hard and petrify'd, and placing it before my Microſcope,

to

to diſcover (if it were poſſible) the figure of thoſe Particles; I could not however compaſs my Intentions, tho I often repeated the Tryal, by reaſon of the ſmallneſs of the Particles, and their ſtrict union with each other; only a few of them appear'd to me four and ſix-ſided, and to reflect the Light from ſo many Parts; others that were bigger were compos'd of ſome three, ſome four ſmaller Particles, which we may thus reckon to be Salt Particles.

Several thouſands of theſe little Particles lay in a very ſmall ſpace, which being ſeparated and broken in pieces, I judged that each Particle did conſiſt of many more and much ſmaller ones; and indeed they were ſo ſmall that they almoſt eſcaped my ſight, thro the beſt of my Microſcopes.

I tryed ſome of the above-mentioned particles in a pretty ſtrong Fire, and found that they loſt ſome of their tranſparency thereby, and were divided into ſmaller particles that were quite dark and obſcure.

After this, I took a little of that Water which lay under the ſuperficies of the ſuppoſed coagulated Salts, imagining I ſhould find ſome Salt-particles in the ſaid Water, and putting it upon 3 ſeveral clean Glaſſes, I obſerv'd after the ſpace of 4 hours the Water to be quite exhal'd, and that there remain'd many thouſands of Salt particles out of one ſingle drop of Water, the which Salts were all ſeparated from one another, many of their ſuperficies being very bright, but their ſides dark; and I could clearly perceive that ſome of their ſuperficies were ſhining, and their figure quadrilateral; the darkneſs of whoſe ſides I judged to be, becauſe thoſe Salts were ſquares, in ſhape like Dice; between theſe Salt particles lay others that were much ſmaller, and I believe of the ſame figure too, but becauſe of their ſmallneſs I could make no certain judgment of them.

After that, the Water which lay very thin was ſuddenly exhaled, I ſaw ſeveral Salts that were larger than the reſt, and more irregular in their figures, but coagulated together, ſome of 'em were ſquares, but not regular.

I took about ten times as much Rain-water, and mingl'd it with the above-mentioned Salt water, and then obſerv'd that the Salts were not diſſolv'd, but emerg'd to the top of the Water, but when I preſt the ſame Salt Particles under Water, ſo as to wet them all over; they ſubſided to the bottom, and remained there without being diſſolv'd, or uniting themſelves to the ſaid Water.

Now ſeeing the great number of Salts extracted from the aforeſaid Stone are of ſo obſtinate and tenacious a figure that nothing but Fire can divide them, and then too they are ſuch inflexible bodies, that they cannot be diſſolved in Water; we may well conclude that the grains of Sand which compoſe ſuch Stones were not only ſoft at the time of their coalition or union with each other, but alſo at the ſame time there intervened a very inflexible fixt Salt (in lieu of Mortar) between the particles of Sand, unleſs you will chuſe to ſay, that each particle of Salt do in ſome degree conſiſt of ſuch fixt Salts.

After this, I took a piece of Hearth-ſtone called *Benthemer* ſtone, becauſe it is found in Quarries in the County of *Benthem*, and is brought to us in great or ſmall Blocks or Parcels; this Stone was ſo ſoft that I could eaſily crumble it between my fingers, as I did, and viewing it with one of my Glaſſes, could perceive nothing but particles of Sand, without the leaſt ſmooth ſide, or regular corners; and it ſeemed to me moreover, that this Sand had acquir'd a ſort of conglutination, or was grown into a ſolid ſubſtance, which we call Stone, a long time after it had been nothing but Sand, and its particles had been worn and collided againſt each other; my reaſon is, becauſe this Sand that had been lately Stone, in the ſides of every grain of it was as full of ſmall holes and breaches as any Sand I ever ſaw; and in viewing them one would imagin that they were compos'd of thouſands of ſmaller particles, and that ſome of them were of a triangular, others of an exact flat quadrangular figure; and when I obſerved theſe Sands in reſt, I judged that the original ſhape of many of them were hexangular, and many were pointed like Diamonds, and thoſe points proceeded or iſſued forth of ſmooth, flat ſides.

The chips and pieces of the *Benthem*-ſtone, as well thoſe that are found in the Pits, as thoſe that are chizel'd off in the working of the ſame by our Stone-cutters, are not thrown away as uſeleſs; but they break them with Hammers almoſt as ſmall as Sand, and the Powder or Crumbles of 'em is what we call *Bik-ſtone*, and is uſed to clean Wooden-work, being very proper to fetch off the filth from Wooden Veſſels, which is not ſtrange, conſidering what ſharp Angles ſuch beaten Stone conſiſts of, not unlike our common Sand. I took a ſmall bit of the ſaid Stone which was very hard, and wrapping it up in Paper, with a little Hammer broke it in pieces, but could obſerve no other difference between the former Sand and this, excepting, that the particles of the laſt were much ſmaller.

I took a piece of another Stone, which we call Alabaſter Stone, and of which, little or none comes to us, ſave what is wrought into Images, *&c.* and having viewed it ſeveral times, I obſerved after breaking or beating it very ſmall, that the little particles were very thin and pellucid, and their figure a long and flat ſquare, with two ſharp corners and two blunt ones; and tho I ſaw among them ſome others that were not quite ſo regular, yet I fancy'd that that exactneſs and regularity of their figures had been loſt in the violent ſeparating them from one another.

The above-mentioned particles, were for the moſt part ſo exceeding ſmall, that they could hardly be ſeen thro my beſt Microſcope, but ſome of them (whoſe figure being greater, I could more eaſily diſcern) appeared to be compoſed of very thin parricles lying upon each other.

Now, when I viewed thoſe particles of Stone that were as large as grains of Sand, I found that each of them was compoſed of ſeveral thouſands of ſmaller particles, whoſe ſhape I could not for my life diſcover; and when I made a little bit of the ſaid Stone red hot and dropt it into the Water, it diſſolv'd into a white ſubſtance as fine as Meal or Flower, and thereby loſt all its tranſparency, and each particle, tho its figure had been a longiſh ſquare, was now compos'd of ſuch ſmall particles, that it was impoſſible to perceive any ſhape it had.

After this, I took another little piece of Stone, which is called a Mineral-ſtone, and was brought hither from *Sumatra*; the which was ſo rich, that the hundred weight of it contained near fifty Gilders of Silver, and thirty in Gold.

I took of the ſaid Stone about the bigneſs of a common Bean, and putting it over a pretty ſmart Fire, the Sulphur, of which there was a great deal in the Mineral, ſtood in bubbles, and remained upon the Stone in the figure of round, black, burnt Globules; then I dropt it red hot into Water, where it remained whole, only with this difference, that whereas before it was very hard, now it became very brittle, and having broken it, I perceiv'd it to conſiſt of irregular particles chiefly, tho ſome few were of an exact Diamond-cut; but that which pleaſed and ſatisfied me moſt, was, that I could behold much more plainly than before, the globules of Gold and Silver lying ſeparately from one another, but ſome of the former were ſo exceeding ſmall, that they almoſt eſcaped the ſight in the Microſcope; and foraſmuch as the Gold is not near ſo eaſy to be melted as the Silver, I ſaw ſome that the Fire had not force enough to reduce it to globules, and upon it lying a ſmall globule of Silver, which the Fire had brought into that figure; and tho the Gold and Silver toucht each other, yet they were not united, becauſe the Fire where that Gold lay was not ſtrong enough to reduce it to a fluid body.

I have often obſerved in theſe Mineral Stones, that one part of 'em was white, and another a little lower in the ſame Stone a dark grey, and that they are brought to us in little pieces, the biggeſt not exceeding a joint of ones Finger, and that in ſome few pieces there were little cavities or breaches, wherein I never met with any Metal, either of Gold or Silver (for in that Mineral there is no other) but oftentimes with very ſmall Cryſtals; I call them ſo, bacauſe of the analogy of their Figures with thoſe of Rock-Cryſtal, for like them they are tranſparent, hexangular, and end in a point or ſpire.

Theſe Cryſtals were in the white part of the Stone, for thoſe that were in the grey were not pellucid.

I cauſed a ſmall particle of ſuch Cryſtal, ſo as it appeared thro my Glaſs, to be deſigned by the Limner, and Fig. 9. R S T V repreſents it as bright and clear as ever you ſaw any Cryſtal; I have ſeen ſome that were not near ſo tranſparent, but indeed they were taken out of Mineral ſtones that were of a dark grey colour.

Some are apt to believe that theſe Cryſtals are form'd by the exhaling damps or moiſtures deep in thoſe Mines, from whence the Mineral ſtone is dug; but this is contrary to my ſentiments, for upon that hypotheſis, the whole cavities ſhould be fill'd with the particles, whereas we find the contrary, for I have obſerv'd that not one fourth part of the cavities are filled therewith; and I have found ſome of the ſaid Cryſtals in ſuch ſmall cavities that a pins head would have fill'd them, and in breaches of the Mineral ſtone that were not ſo broad as a ſmall pin is thick, whereas I could meet with none of theſe Cryſtals in other cavities that were much larger.

I will rather ſuppoſe that moſt of the ſtony matter where thoſe cavities are found, was of the ſame configuration as the ſaid Cryſtals, and at the ſame time of the coalition or union of the particles of Stone, the intercepted Air occaſioned ſome cavities, in which the Cryſtals were ſhut up, and in which they acquired the figure which they now retain ; in the mean time the other parts about theſe cavities were ſo firmly united as to become a hard and ſolid Stone.

Before that I conſider'd the conjunction of the particles of divers Stones, I imagined that theſe particles were united to each other by ſuch a fixt Salt, that nothing but Fire could ſeparate them ; but I am convinced now that this ſuppoſition will not hold in all Stones.

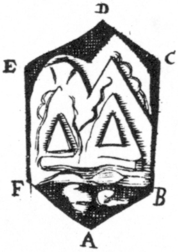
VI. *Part of two Letters from Mr* Thoresby, *F. R. S. to the Publiſher, concerning an Earthquake, which happened in ſome places of the North of* England, *the 28th of December,* 1703.

YOU have heard, no doubt, of the late *Earthquake* that affected ſome part of the North, as the dreadful Storm did the South ; it being moſt obſervable at *Hull*, I was deſirous of an account from thence, that might be depended upon, and therefore writ to the very obliging Mr *Banks*, Prebendary of *York*, who being Vicar of *Hull*, was the moſt ſuitable perſon I knew to addreſs my ſelf unto, and he being pleaſed to favour me with a judicious account of it, I will venture to communicate it to you, with his pious reflection thereupon. ‘ As to the ‘ Earthquake you mention, it was felt here on *Tueſday*, ‘ the 28th of the laſt Month, which was *Childermas* day, ‘ about 3 or 4 minutes after 5 in the Evening ; I confeſs I ‘ did not feel it my ſelf, for I was at that moment walking ‘ to viſit a ſick Gentleman, and the noiſe in the Streets, ‘ and my quick motion, made it impoſſible, I believe, for

‘ me

TAB: I

Fig: 1-



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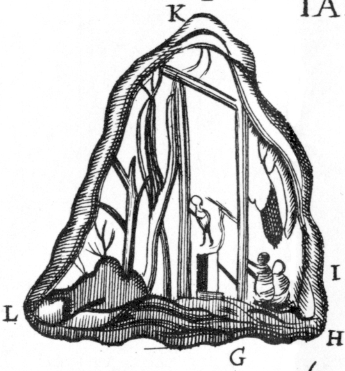

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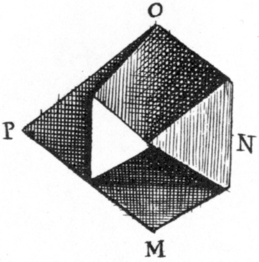

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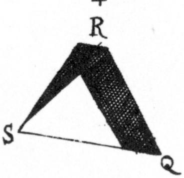

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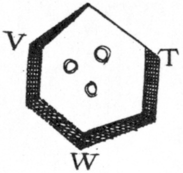

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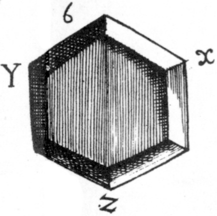

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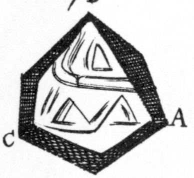

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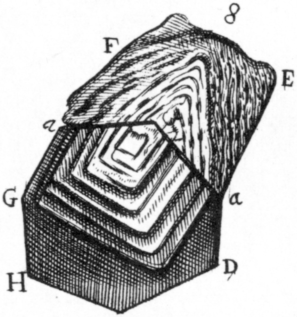

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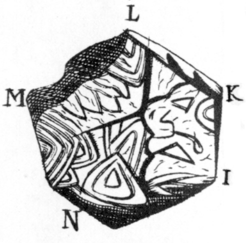

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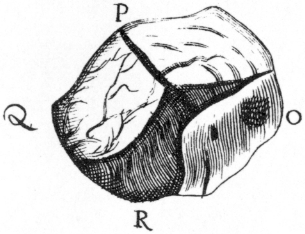

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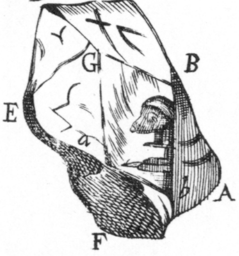

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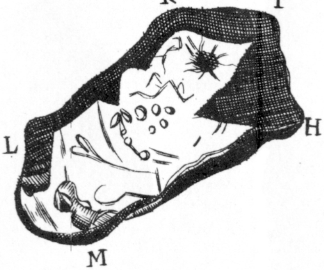

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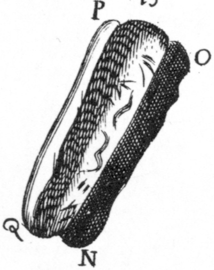

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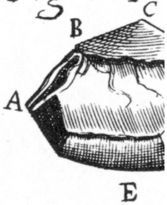

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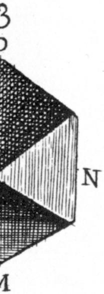

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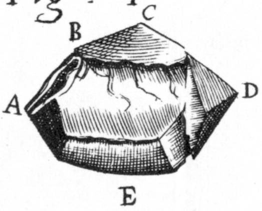

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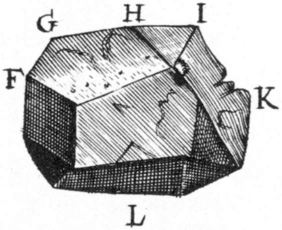

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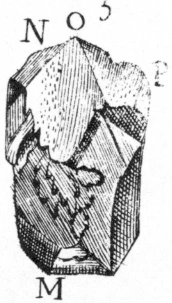

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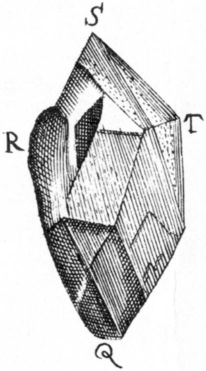

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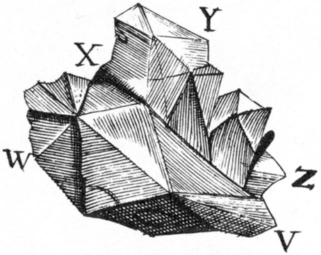

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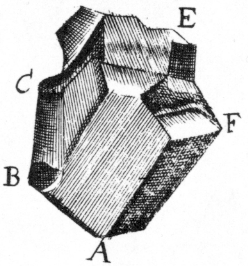

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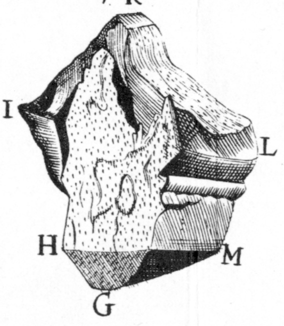

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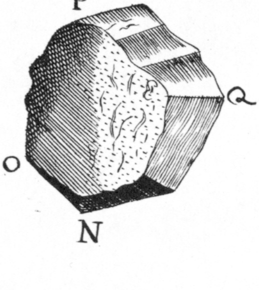

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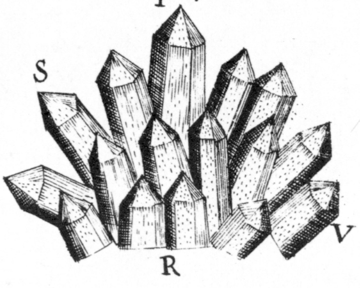

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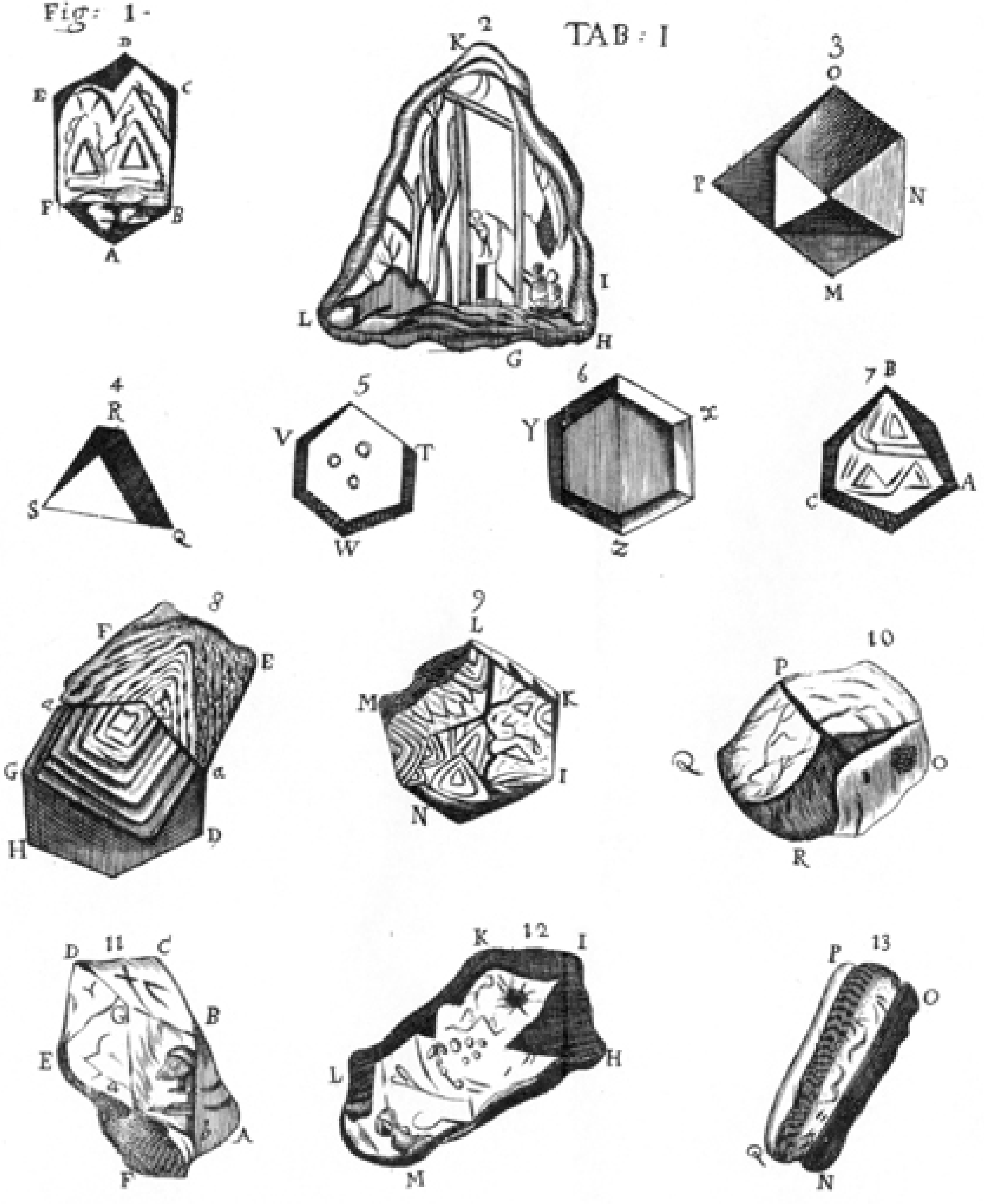

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